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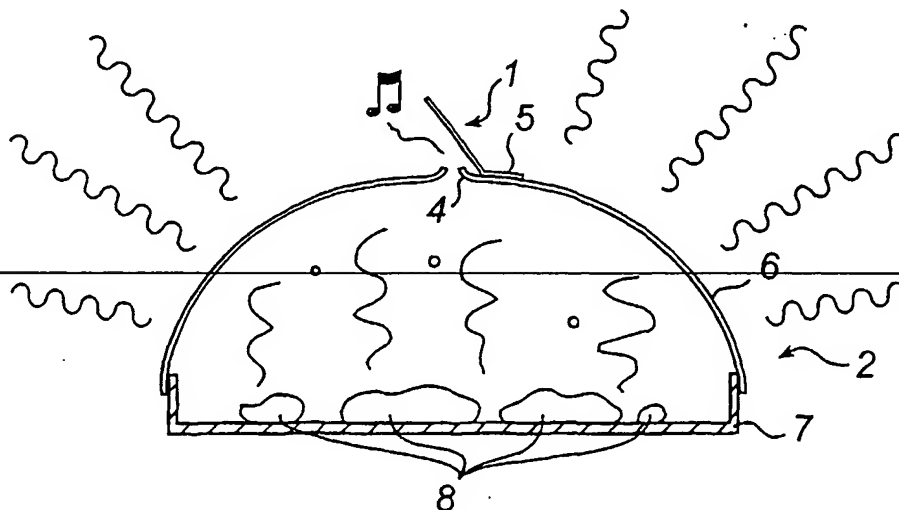
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SINGLE-USE ONE-WAY VALVE FOR FOOD PACKAGE THAT EMITS SOUND SIGNAL AT SUFFICIENT HEATING



(57) Abstract: The present invention concerns a single-use valve (1) for mounting on a package (2), particularly food packages the contents of which are to be heated in a microwave oven (3). The valve (1) is arranged to open in response to an excess pressure generated inside the package (2) upon heating of said package (2). The valve comprises an opening (4) formed in the package (2), on top of which opening (4) an adhesive layer (5) is applied. The valve (1) is also arranged to emit a sound signal when subjected to said pressure load.

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**Single-use one-way valve for food package that emits sound  
signal at sufficient heating**

Technical field of the invention

The present invention relates to a single-use valve intended to be mounted on a package, particularly food  
5 packages the contents of which are to be heated in a microwave oven, said valve arranged to open in response to an excess pressure generated inside the package upon heating of the latter.

10 Background of the invention

In food packages, for example of the kind that contain heat-and-eat one-portion dishes and that are sold in refrigeration and freezing compartments, respectively, to be heated or cooked to ready-to-eat state in a microwave  
15 oven, the food product usually is placed in a heat-resistant tray covered by plastic film. When the package is to be heated, the plastic film is either removed or apertures are pierced therein and the entire tray is then placed inside the microwave oven. Because of the varying  
20 performance of different types of microwave ovens and because the food product absorbs microwave energy differently, depending on the composition and the temperature of the food product, heating times vary considerably. Consequently, it is difficult to give recommendations to  
25 the consumer as to the exact heating times required to reach the ready-to-eat state. The consumer therefore

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might have to open and reopen the microwave door several times to convince himself that the dish is completely hot or completely cooked. However, it is difficult to establish  
30 whether all parts of the dish are hot or if locally it is still cold, and this is due to the inherent difficulty of microwave ovens to heat the food product evenly. Over-heating of the food is not either recommendable, since in this case the tray or the plastic film still po-

sitioned thereon may melt locally and ruin the food, or since overheating makes the food soggy, over-cooked and unpalatable. The consumer therefore should remain beside the microwave oven during the heating in order to check  
5 when the food product has reached the ready state.

#### Summary of the invention

The object of the present invention therefore is to remove this problem.

10 This object is achieved by means of a valve of the kind defined in the introduction, possessing the characteristic features defined in claim 1. Preferred embodiments of the valve appear from the claims depending on claim 1.

15 The present invention relates to a single-use valve, which is intended for mounting on a package, particularly on food packages, the contents of which are to be heated in a microwave oven. The valve is arranged to open in response to an excess pressure generated in said package as  
20 the latter is being exposed to heat. The inventive valve is arranged to emit a sound signal when subjected to said pressure load. According to the teachings of the invention, the valve is arranged on a package intended to hold food products that are to be cooked/heated by the consumer until they reach a ready-to-eat state. This kind of  
25 package is commonly used for example as single-portion packages holding lunch or dinner dishes. The valve does not open until a predetermined water-vapor pressure is reached inside the package. Inside the package, equaliza-

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30 tion of temperature takes place as hot water-vapor condenses on cold areas of the product (the cold-wall principle). Not until the entire product has reached about 100°C on the surface is it possible for an excess pressure of vapor to generate inside the package. The magnitude of the valve-opening pressure could be determined on  
35 the basis of the resiliency of the valve material, the size of the valve opening or the melting point of the ad-

hesive. The valve emits a sound signal as water vapor flows through the valve. The sound signal indicates to the user that the food product has reached the ready state. In this manner is achieved not only the even heating results aimed for to ensure that some zones of the food product do not remain cold but also the user is given an audible indication that the dish is ready. The user need not open the microwave-oven door to ascertain the condition of the dish but could attend to other matters in the meantime.

Alternatively, the valve is an indication of fracture, a slit or an aperture across which an adhesive layer is disposed. The adhesive layer is arranged in a manner ensuring that it is forced to move, when a flow of air and vapor exits through the valve, in response to which a sound signal is generated.

The valve preferably is configured as a slit formed in the package, on top of which slit an adhesive layer is placed.

At least one part of the adhesive layer is formed with an adhesive of a kind that is suitable for use together with foodstuff, since the invention is primarily intended for food packages.

It is likewise suitable that the adhesive layer is a tape, preferably of a resilient kind to allow it to adapt itself to the movements of the package material during handling and not disengage itself from the support.

The adhesive layer could likewise be a label, thus minimizing the consumption of material as well as the amount of labor required to mark the product in outlet stores.

It is advantageous if the packaging material on which the valve is provided consists of a non-directional laminate. In a directional material, a slit would cause a rent to develop in the material.

Brief description of the drawings

The invention will be described in the following in more detail with reference to the accompanying drawings, which for exemplifying purposes show presently particularly preferred embodiments of the invention. In the drawings:

Fig 1 is an overall view of a package having a valve in accordance with the present invention.

Fig 2 is a cross-sectional view showing two different stages of the process of heating a package having a valve in accordance with the present invention. Fig 2a shows the package in a cold state and Fig 2b the package in a heated state.

Fig 3 is a perspective view, showing a microwave oven.

Detailed description of preferred embodiments

The food package 2 of Fig 1 consists of a tray 7 holding a food product 8. A packaging material 6 in the form of a non-directional laminate is positioned on top of the tray 7 in order to protect the food product 8 from external manipulation during the production and distribution stages. The tray 7 as well as the laminate 6 consist of heat-resistant materials, since their intended function is to enclose food that is to be heated. The laminate 6 is welded to the tray 7 to produce a strong and impermeable seam. The valve 1 in accordance with the present invention is formed in the non-directional laminate 6. The valve 1 is an opening 4 passing through the laminate. A resilient tape 5 the adhesive of which is suitable for use together with foodstuff is placed on top of the opening 4. The location of tape 5 is chosen such that the distance between the opening 4 and the longitudinal edges of the tape 5 in conjunction with the strength of the adhesive of the tape 5 ensures that an excess water-vapor pressure generated inside the package 2 as the food

product contained therein is being heated, is powerful enough to force water vapor out through the opening 4 while passing between the tape 5 and the laminate and in doing so generate a sound signal owing to the vibration of the tape. Alternatively, a slit may be formed in the adhesive layer/tape 5 to prevent the longitudinal edge thereof to open up in an uncontrolled manner.

Fig 2a shows the same food package 2 as Fig 1. The food product 8 is positioned in the tray 7, which is covered by the laminate 6. The valve 1, in the form of opening 4 and tape 5, is provided in the laminate 6. This drawing figure shows the food product 8 in the condition in which it is sold to the consumer, i.e. deep-frozen, refrigerated or stored in some other way. Fig 2b shows the food package 2 while being exposed to microwaves for heating purposes and in the state when the food product 8 is sufficiently warm for the water vapor to create an excess pressure inside the package 2 that is powerful enough to open the valve 1 and generate a sound signal.

Fig 3 finally shows a microwave oven 3, in which the food package 2 may be positioned for heating of the food product 8.

As will be realized numerous modifications of the embodiment described above are possible within the scope of protection as defined in the appended claims. For example, instead of consisting of a tray 7 and a non-directional laminate 6, the food package 2 could be formed entirely of a plastic film or some other material suitable for storage of food 8. However, some part of the package

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2 should consist of a type of non-directional laminate 6 that is suitable to form the valve 1 in accordance with the invention. The food package 2 could hold for example refrigerated or deep-frozen products. The size and shape of the tape 5 or label are not restricted to the shown embodiment.

The function of the valve 1 remains the same also if an indication of fracture is impressed into the non-di-

rectional laminate 6 or an etching is made therein in such a manner that the laminate 6 still is in one piece with no through-passage opening formed in the material. The indication of fracture means that the packaging material 6 offers perfectly satisfactory protection to the contents inside the package 2 without having any contact with the adhesive layer up to the point, when the package 2 is heated. In the heating process, water vapor forms in the usual manner, and upon a predetermined excess pressure inside the package 2 it breaks the indication of fracture, whereby an opening 4 is formed, and vapor is forced outwards and together with the adhesive layer it generates the sound signal. The strength of the package material 6 itself is sufficient to prevent the material from bursting should an indication of fracture not have been provided. If for some reason the material should burst anyway, no sound signal would be emitted, since in all likelihood an uncontrolled rift in the material would be of a configuration that cannot produce a sound.

20 In addition it is possible to provide a sound-emitting element of a flute-like type on top of the opening 4 in the package 2. This sound-emitting element likewise would serve to indicate when the food product 8 inside the package 2 is heated to the ready. It is likewise possible to give the slit in the package another shape than

25 a straight one, for instance a V-shape.

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## CLAIMS

1. A single-use valve (1) for mounting on a package (2), particularly food packages the contents of which are to be heated in a microwave oven (3), said valve (1) arranged to open in response to an excess pressure generated inside the package (2) upon heating of the latter,  
c h a r a c t e r i z e d i n  
that valve comprises an opening (4) formed in the package (2), an adhesive layer (5) being applied on top of said opening (4), and in that said valve (1) is arranged to emit a sound signal when subjected to said pressure load.
2. A valve (1) as claimed in claim 1, wherein said opening (4) is in the form of a slit (4).
3. A valve (1) as claimed in claim 2, wherein said slit (4) is straight.
4. A valve (1) as claimed in claim 1, wherein at least one portion of the adhesive layer (5) comprises an adhesive that is suitable for use in conjunction with foodstuffs.
5. A valve (1) as claimed in claim 1, wherein said adhesive layer (5) is a tape.
6. A valve as claimed in claim 5, wherein said tape (5) is resilient.
7. A valve (1) as claimed in claim 1, wherein said adhesive layer (5) is a label.
8. A valve (1) as claimed in claim 1, wherein said packaging material (6) in which said valve (1) provided, consists of a non-directional laminate.



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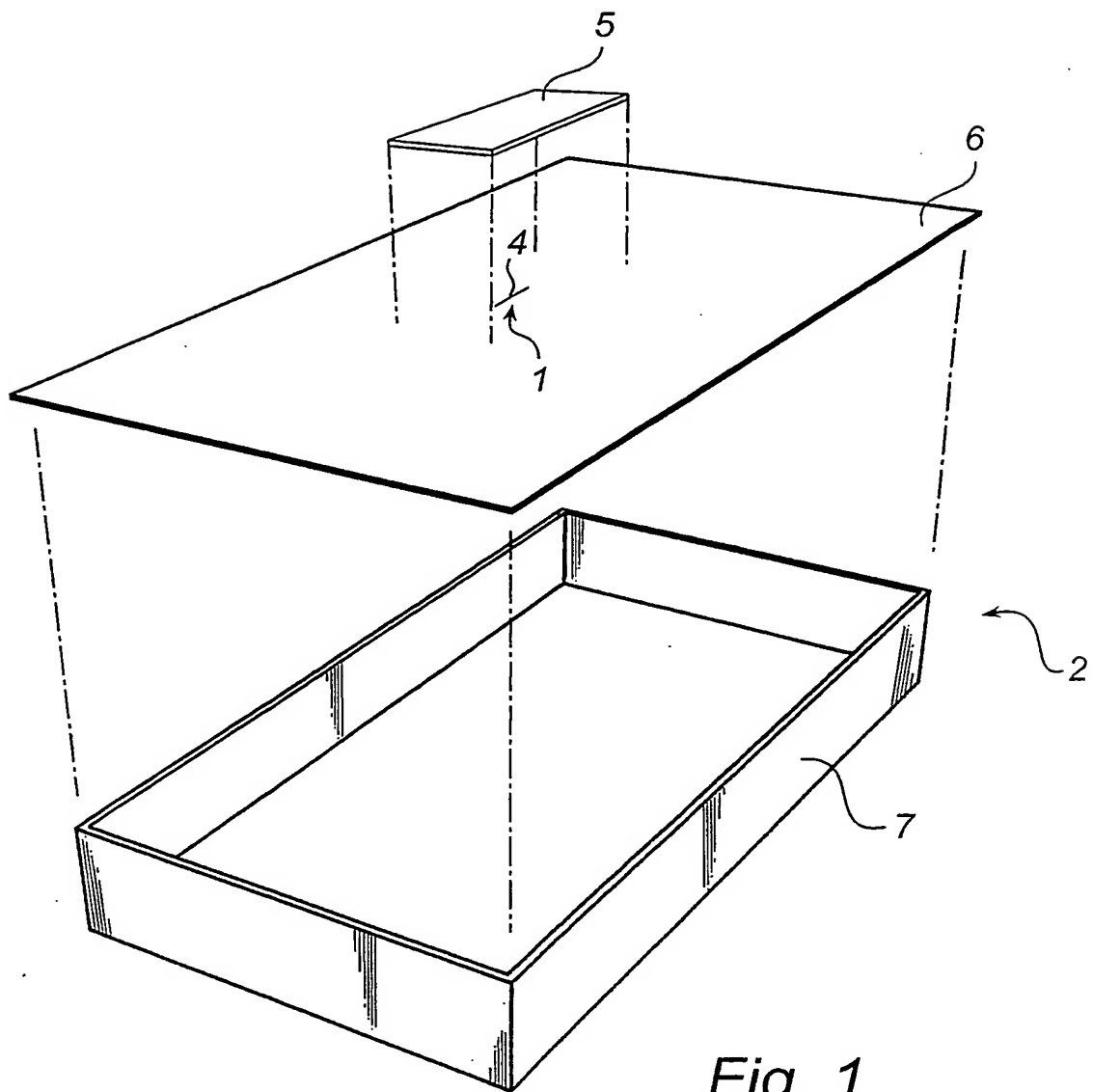


Fig. 1

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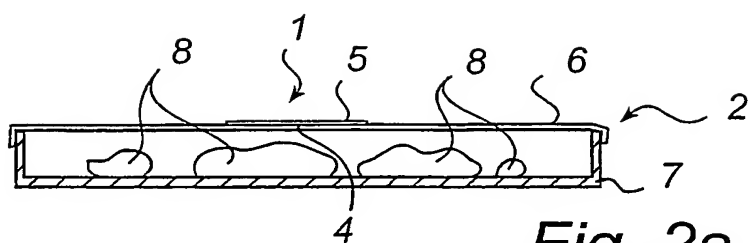


Fig. 2a

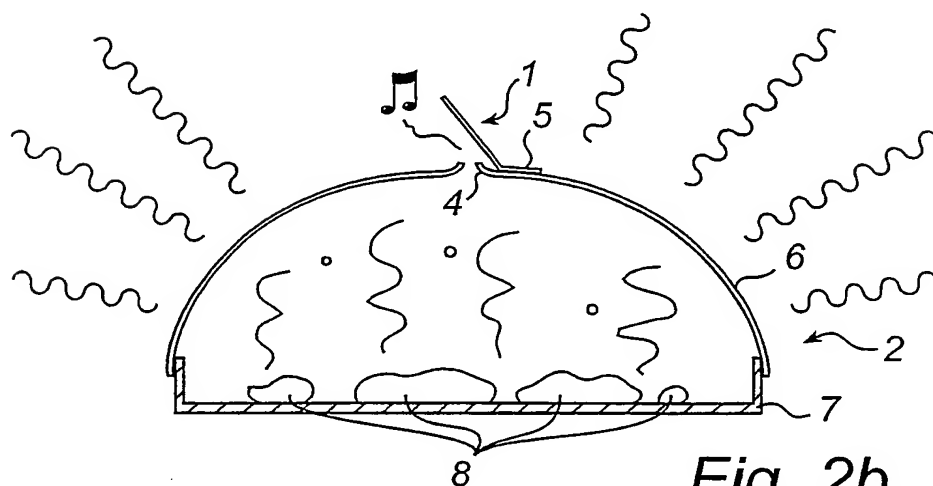


Fig. 2b

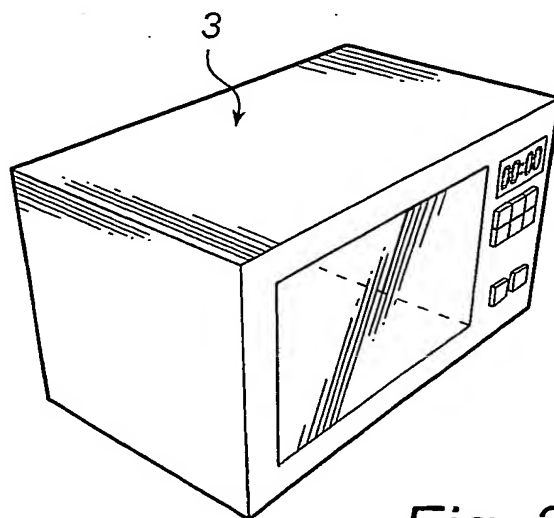


Fig. 3

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 03/00325

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B65D 51/16, B65D 81/34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0288862 A1 (KABUSHIKI KAISHA NAKAMURAYA), 2 November 1988 (02.11.88), column 1, line 52 - column 2, line 26 --	1-8
A	Patent Abstracts of Japan, abstract of JP 11-208740 A (NISSIN FOOD PROD CO LTD), 3 August 1999 (03.08.99) -----	1-8

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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## INTERNATIONAL SEARCH REPORT

### Information on patent family members

02/06/03

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Patent document cited in search report			Publication date	Patent family member(s)		Publication' date
EP	0288862	A1	02/11/88	AU	616882 B	14/11/91
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